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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Watervliet Reservoir Dam was judged to be unsafe-emergency. Immediate replacement of the penstock.

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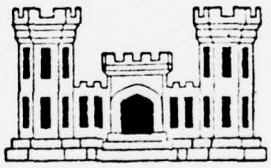
HUDSON RIVER BASIN

WATERVLIET RESERVOIR DAM

ALBANY COUNTY, NEW YORK
INVENTORY NO. 88

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 5, 1978

LOWER HUDSON RIVER BASIN
WATERVLIET DAM
INVENTORY NO. 88
PHASE I INSPECTION REPORT

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APPENDICES

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: WATERVLIET (I.D. NO. 88)

County Located: ALBANY COUNTY

Stream: LOWER HUDSON RIVER

Date of Inspection: 5 - 6 JUNE 1978

ASSESSMENT

Visual inspection of the Watervliet Dam at French's Mills revealed a hazardous condition with potential for causing severe damage to and, possibly, structural collapse of the dam. The condition consists of severe corrosion of two sections of fabricated pipe in the penstock which passes through the dam in the first bay near the north abutment. Sudden rupture of the pipe could cause severe hydraulic impact loading on the downstream face of the dam, the buttresses and the buttress foundation.

The extreme corrosion of the pipe sections is considered to represent an unsafe condition of the dam. The safest course of action would be to completely shut the 48-inch gate valve upstream of the corroded pipe sections until their replacement. However, bearing in mind that the penstock carries the City of Watervliet's only water supply, a recommended alternative procedure would be to close the upstream gate valve so as to substantially reduce the water pressure in the corroded pipe sections and yet provide the water requirements of the city until the replacement is made. If this alternative is elected it is recommended that replacement of the corroded pipe sections be made within 30 calendar days of the date of this report and that surveillance and warning systems be put into effect until replacement has been made.

The spillway capacity without flashboards is 79 percent of the estimated Standard Project Flood and with about 1.5 feet flow over the abutments it would pass the entire flood. Therefore, from a hydraulic and hydrologic standpoint the spillway capacity is considered to be inadequate. However, as the dam is located in a confined valley with rock abutments, overflow of the abutments will not cause significant erosion or undermine the foundation of the dam. Surveillance of the dam should be standard practice during major floods.

Eugene O'Brien, P.E.
New York No. 29823

Approved by:

Col. Clark H. Benn
New York District Engineer

Date: 25 July 78

OVERVIEW OF AMBURSEN DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WATERVLIET DAM AT FRENCH'S MILLS, INVENTORY NO. 88
LOWER HUDSON RIVER BASIN
ALBANY COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS, by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection

The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam

The Watervliet Reservoir is formed by an Ambursen Dam (reinforced concrete flat slab and buttress) built across the Normans Kill at French's Mills.

The principal dimensions of the dam are:

Length of dam at top (bank to bank)	380 feet
Length of overflow spillway crest	324 feet
Maximum height	36 feet
Maximum height with flashboards	39 feet
Width at foundation	74 feet

The spillway is ungated and formed by the downstream face of the dam. Its crest is at El. 256 and flashboards which are permanently in place raise the reservoir level to El. 259. A 50-inch penstock through the dam near its northern end, controlled by a 48-inch gate valve, supplies water to the pumping station downstream for the City of Watervliet. A low-level outlet, 5 feet in diameter and controlled by a 4-foot sluice gate, goes through the dam toward its southern end.

b. Location

The dam is located on the Normans Kill at French's Mills approximately 3.5 miles south of Schenectady in Albany County.

c. Size Classification

The dam is less than 40 feet high and the usable storage volume is less than 50,000 acre feet; therefore, it is considered to be an "intermediate" size dam.

d. Hazard Classification

The dam is in the "high" hazard potential category. A pump station and several homes downstream would be affected by a breach of the dam.

e. Ownership

The Watervliet Dam is owned and operated by the City of Watervliet.

f. Use of Dam

The impoundment provided by the dam serves as a water supply reservoir for the cities of Watervliet and Guilderland.

g. Design and Construction History

The dam was designed by Solomon, Norcross & Keis, Engineers, of Atlanta, Georgia in 1915 and built in 1916.

h. Normal Operating Procedures

Water releases to supply Watervliet are approximately 3.5 mgd. When the reservoir level is high, an additional 3.5 mgd, flowing through the same penstock, powers the hydraulic turbines at the pumping station. The turbines are mechanically linked to two pumps which provide water for the city system. As the reservoir level gets lower, more water is required for pumping. When the level gets very low, to conserve water electric pumps at the pumping station are used instead. The electric pumps can be used at any reservoir level.

An additional 1.0 mgd is supplied to the Town of Guilderland through a separate penstock. Water flowing over the ungated spillway continues directly into the Normans Kill.

1.3 PERTINENT DATA

a. Drainage Areas (sq. miles)	113.6
b. Discharge at Damsite (cfs)	
Maximum known flood at damsite (estimated)	10,900
Total spillway capacity at maximum pool elevation	30,500

c. Elevation (ft above MSL)

Top of dam	264.5
Maximum pool-design surcharge	264.5
Spillway crest (with flashboards)	259
Streambed at centerline of dam	220

d. Reservoir (miles)

Length of maximum pool	2

e. Storage (acre-feet)

Normal operating pool	5,000
Design surcharge	3,990
Top of dam	8,990

f. Reservoir Surface (acres)

Maximum pool	430

g. Dam

Type - Ambursen, reinforced concrete flat slab and buttress
Length 380 feet
Height 36 feet
Side Slopes - U/S 1.0 (V) on 1.0 (H) (scaled)
- D/S 1.7 (V) on 1.0 (H) (scaled)
Grout curtain - None

h. Spillway

Type - Concrete slab, D/S face of dam
Length of weir - 324 feet
Crest elevation - 256
with flashboards - 259
Gates - ungated
U/S channel - None
D/S channel - Normans Kill

i. Regulating Outlets

A 50-inch penstock passes through the dam near its northern end and is controlled by a 48-inch gate valve. The centerline of the penstock in the upstream face of the dam is at El. 240.

A 5-foot diameter conduit through the dam near its southern end is controlled by a 4-foot sluice gate. The invert of the conduit at its upstream end is El. 222.6.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The design of the dam was made by Solomon, Norcross & Keis, Engineers, Atlanta, Georgia in 1915. There are no design computations or specific design memoranda available for the project. There are contract drawings of the dam in "Proposal, Contract and Specifications for a Municipal Water Supply from the Normans Kill at French's Mills for the City of Watervliet, New York".

A training wall at the north abutment was reportedly built during a ten-year period following the original construction because of erosion in that area due to heavy spillway flows. This wall was raised two to three feet in 1955, in accordance with a drawing and specifications by Keis & Holroyd, Consulting Engineers, Troy, New York.

A new concrete apron was added just downstream of the original structure in 1936, as shown on a drawing by V.G. Lamb, City Engineer of Watervliet.

In 1965, the spillway and concrete apron were resurfaced with gunite. Cavities in the concrete on the spillway face were filled, and joints between slabs were cleaned and filled with pitch. The extent of repairs is shown on a drawing by J. Kenneth Fraser & Associates, Rensselaer, New York. The work was reportedly carried out in the winter.

The three-foot high flashboards were reportedly replaced in the summer of 1975.

2.2 CONSTRUCTION RECORDS

No detailed construction records are available.

2.3 OPERATION RECORDS

There is no operation and maintenance manual for the project. Some work orders indicating repairs made are kept in the pumping station. There is no regular schedule of maintenance.

2.4 EVALUATION OF DATA

Existing data were made readily available at the Watervliet City Hall and at the Watervliet Reservoir Pumping Station.

The available data reviewed are considered adequate for this Phase I inspection and evaluation of safety.

SECTION 3 - VISUAL INSPECTIONS

3.1 FINDINGS

a. General

A visual inspection of Watervliet Dam at French's Mills was made on Monday and Tuesday, June 5 and 6, 1978. At that time, the reservoir level was at approximately one inch over the flashboards and flowing onto the spillway.

b. Dam

The concrete surfaces visible from the walkway through the dam were in good condition. There were no signs of seepage, movement or other distress. The toe drains were not visible due to the presence of water in the bays, and, in some bays, excavated rock which was not removed.

c. Spillway

At the time of inspection water was flowing over the spillway. However, excessive and widespread spalling of the gunite layer was clearly visible. At the vertical joints between slabs there were pockets of erosion which appeared to be several inches deep. Cracks in the spillway apron were visible.

It has been reported that the remaining gunite on the spillway is drummy and the gunite has been completely eroded off the new apron; also that the shale under the new apron has eroded away in spots.

Toward the north abutment, a number of the bars holding the flashboards are deflected several inches at the top, reportedly due to the effects of a hurricane in 1960. At the north abutment, the top flashboard (1 foot high) is broken off for about 5 feet.

d. Abutments

Seepage was observed through the rock at the south abutment within the dam, entering at approximately the top of the dam. It was estimated to be about 5 gpd. According to casual observations, there has supposedly been no increase in this flow. The water has reportedly been tested and is not from the reservoir, but from a spring within the abutment rock.

The training wall at the south abutment is visibly eroded and undermined with a cavity formed beneath the concrete up to 3 feet deep.

The training wall at the north abutment is in a similar condition with wire mesh exposed from under the eroded gunite layer on the concrete apron in this area.

From examination of the abutment rock, it was determined that the dam is founded on thinly bedded sound shale with foliations having a strike oriented approximately 30° with respect to the face of the dam in a northeasterly direction and dipping approximately 5° - 10° upstream.

e. Outlets and Regulating Gates

The low-level discharge system consists of a normally closed 48-inch sluice gate discharging to a 60-inch concrete pipe, which conducts water through the dam and discharges it on the downstream face. The gate is original equipment and, according to available drawings, is in a recess on the upstream face of the dam, at invert El. 224.5. It is operated by a manual valve stand located within the dam. Three years ago a motor operator was reportedly installed, but due to unsatisfactory operation, was replaced with the original manual stand two years later.

The sluice gate was completely submerged, not allowing for inspection. The gate stand operator was lubricated and appeared to be in operating order, although the gate was difficult to operate. No leakage at the operating stand was observed.

The low-level discharge pipe inside the dam appeared in good condition.

A 50-inch penstock, with invert El. 238.5 on the upstream face of the dam, conducts water through the dam to a pumping station approximately 0.5 miles downstream. The flow through the penstock can be regulated by a gate valve within the dam or by valves at the pumping station, the latter being the usual procedure.

The penstock section inside the dam consists of riveted and flanged pipe sections, two cast iron flanged quarter bends and the gate valve. The penstock is 50 inches in diameter entering the dam, reduces to 48 inches at the gate valve, and increases to 50 inches upon leaving the dam. All are reported to be original equipment.

The gate valve appeared to be in good condition. The gear actuator was clean and lubricated and appeared to be completely operable. About 1964, the valve stem was replaced. During the inspection, the packing was slightly damp. Arrangements have reportedly been made to add an electric motor operator to the valve.

The cast-iron sections appeared to be in good condition.

Two 4-foot sections of penstock, adjacent to the cast-iron bends, were observed to have heavy surface corrosion over their entire surface including the flanges. Large amounts of corrosion by-products could be removed from the pipe surface, many of the rivet heads holding the pipe to the flange could be broken from their stems and strips of material could be peeled from the flange, all by hand. Due to the severity of the corrosion,

the depth of the pits from the original surface was indeterminable. Many of the bolts through the flanges were also observed to have severe material losses.

f. Downstream Channel

The downstream channel, the Normans Kill, is riprap-lined for some distance. The piers of two active railroad bridges are about 75 yards downstream of the dam.

g. Reservoir Area

In the vicinity of the dam, there was no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION

The severe corrosion on fabricated penstock sections within the dam is considered to be a hazardous condition. Sudden rupture of the pipe could cause severe hydraulic impact loading on the downstream face of the dam, the buttress and the buttress foundation.

The spalling and drumminess of the gunite layer on the spillway face and the erosion of rock and concrete at the abutments and the apron are not considered to be conditions which are hazardous to the safety of the dam.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The minimum required water release at Watervliet Dam is 3.5 mgd for the City of Watervliet and one mgd for the Town of Guilderland, through separate penstocks. The water supply for Watervliet requires an additional 3.5 mgd or more, depending on reservoir level, to power the hydraulic turbines for pumping the water. When the reservoir is low and much more water is required to power the turbines, a switch is made to electric power. There is generally little or no regulation other than maintaining the required release.

4.2 MAINTENANCE OF DAM

There is no operation and maintenance manual for the project. A pump tender is always on duty at the pumping station, approximately 0.5 miles downstream of the dam. He visits the dam as required, in relation to the release of water, but does not necessarily examine the dam. There is no formally established program of inspection visits or maintenance procedures for the dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

The sluice gate stand operator was lubricated and appears to be operational although the gate was difficult to operate. It was reportedly "exercised" about 3 years ago when new gate seals were installed. Prior to that, the gate was "exercised" every 1 to 2 years.

The gate valve on the water supply penstock appeared to be operational and was reportedly completely open during the inspection. It was "exercised" about 6 months ago, and prior to that, every 6 to 24 months.

No records of gate or valve operation were kept.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect or in preparation.

4.5 EVALUATION

Considering the severe corrosion of sections of the penstock cited previously, there appear to be deficiencies in the present operational or maintenance procedures which could adversely affect the safety of the project. A periodic inspection program should be established.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Watervliet Dam is located on Normans Kill, about four miles south of Schenectady, and about eight miles west of Albany. The total drainage area at the dam is 113.6 square miles, computed from the difference between the drainage areas at the dam site and at the gaging station downstream near Westmere, New York.

The drainage area is glaciated region cut by steep hills and ridges oriented generally in a northeast-southwest direction. Cover in the basin consists of open fields or woodland. There is little natural storage in the area. The drainage area slopes and the pattern of tributaries is not conducive to high flood flows.

5.2 SPILLWAY CAPACITY

The spillway length is 324 feet and the maximum head possible to the top of the endwalls is 8.5 feet, assuming no flashboards. No data are available on the discharge rating of the spillway, so a weir coefficient of 3.8 was assumed. The computed spillway discharge, at maximum head is 30,500 cfs (280 cfs per square mile). The spillway rating curve, shown on Figure 1, was computed assuming that the weir coefficient varied from 3.8 at 8.5 feet, to 3.0 at 0.5 feet head.

5.3 RESERVOIR CAPACITY

The total reservoir capacity at El. 259.0 (i.e., the spillway crest elevation of 256.0 plus 3.0 ft of flashboards) is 1,630 million gallons (5,000 acre-feet). From a capacity curve, supplied by Malcolm Pirnie Engineers, a surcharge storage of 1,300 million gallons (3,990 acre-feet) is available between the crest (El. 256.0), and the top of the dam (El. 264.5). This storage is equivalent to only 0.66 inch of runoff over the drainage basin.

5.4 FLOODS OF RECORD

Before 1967 there were no continuous records of the flows in Normans Kill. However, indirect discharge measurements taken after the August-October 1955 floods indicated a maximum discharge of 13,300 cfs at Slingerlands from a drainage area of 169 square miles. Transposed by the ratio of square roots of the drainage areas, this would be about 10,900 cfs at the dam or about 96 cfs per square mile. At the gaging station established at Westmere in 1967 (drainage area, 131 square miles) the maximum discharge is 4390 cfs in November 1972.

5.5 OVERFLOW POTENTIAL

Derivations of the Standard Project Flood (SPF) for the Mohawk River Basin are available in a report prepared by the New York District, U.S. Corps of Engineers.[1] Data in this report permitted interpolation of the SPF for Normans Kill at the Watervliet Dam. The indicated SPF was 380 cfs per square mile, or a total of 38,600 cfs, or 1.2 times the spillway discharge capacity. Such a flood discharge is 3.5 times the estimated maximum flood at the dam since 1955.

A second criteria for evaluating a design flood is the Probable Maximum Flood (PMF), which is usually about twice the SPF. A PMF of 78,000 cfs (709 cfs per square mile [2]) was estimated from a plot of Probable Maximum Floods versus drainage area for several selected rivers (Ref. 2, Table B.1). This would indicate an SPF of 39,000 cfs which agrees with the first estimate.

5.6 EVALUATION

The spillway capacity without flashboards is 79 percent of the estimated Standard Project Flood and with about 1.5 feet flow over the abutments it would pass the entire flood. Therefore, from a hydraulic and hydrologic standpoint the spillway capacity is considered to be inadequate. However, as the dam is located in a confined valley with rock abutments, overflow of the abutments will not cause significant erosion or undermine the foundation of the dam. Surveillance of the dam should be standard practice during major floods.

1/ Development of Hydrologic Models for Flood Studies of the Upper Hudson and Mohawk Basins - May 1976.

2/ Design Basis Floods for Nuclear Power Plants, Regulating Guide 1.59, U.S. Nuclear Regulatory Commission, Revision 2, August 1977.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate either existing or potential conditions of the structure itself which would adversely affect the structural stability of the dam. However, as previously cited, a sudden rupture of one of the heavily corroded penstock sections could cause severe hydraulic impact on parts of the dam or its foundation, possibly leading to structural collapse.

b. Design and Construction Data

There exists no design computations or other data regarding the structural stability of the dam.

Performance experience with the water level approximately 3 feet above the spillway flashboards is good.

c. Operating Records

No operating records are kept. No major operational problems which would affect the stability of the dam were reported. However, considering the severe corrosion of sections of the penstock cited previously, which could indirectly affect the stability of the dam, a periodic maintenance and inspection program should be established.

d. Post-Construction Changes

There are no records of construction changes other than the north abutment training wall and extension and the new concrete apron.

e. Seismic Stability

The dam is located in Seismic Zone No. 2; therefore, no seismic analyses are warranted.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Visual inspection of the Watervliet Dam at French's Mills revealed a hazardous condition with potential for causing severe damage to and, possibly, structural collapse of the dam. The condition consists of severe corrosion of two sections of fabricated pipe in the penstock which passes through the dam in the first bay near the north abutment. Sudden rupture of the pipe could cause severe hydraulic impact loading on the downstream face of the dam, the buttresses and the buttress foundation.

b. Urgency

The extreme corrosion of the pipe sections is considered to represent an unsafe condition of the dam. The safest course of action would be to completely shut the 48-inch gate valve upstream of the corroded pipe sections until their replacement. However, bearing in mind that the penstock carries the City of Watervliet's only water supply, a recommended alternative procedure would be to close the upstream gate valve so as to substantially reduce the water pressure in the corroded pipe sections and yet provide the water requirements of the city until the replacement is made. If this alternative is elected it is recommended that replacement of the corroded pipe sections be made within 30 calendar days of the date of this report and that surveillance and warning systems be put into effect until replacement has been made.

c. Additional Investigations

It is recommended that the remaining penstock sections and fittings within the dam be tested by non-destructive methods, such as ultrasonic testing, to determine their soundness.

d. Adequacy of Information

The information and data available were adequate for performance of this investigation. However, there is a lack of information with regard to operation and maintenance, as follow:

1. Operations and maintenance manuals and records.
2. Records of inspections.

7.2 REMEDIAL MEASURES

Aside from the replacement of penstock sections mentioned in Paragraph 7.1b, the following remedial measures should be taken as soon as feasible:

a. The 48-inch gate valve motor operator which, reportedly, will be installed should be waterproof and should include a control unit outside the dam.

b. The concrete training wall and rock erosion at both abutments should be repaired.

c. The concrete apron should be inspected for reported undermining, and repairs made as required.

d. The spalling of the spillway surface, the reported drumminess of the remaining gunite on the spillway and the cavities at the vertical joints on the spillway should be repaired.

e. After the testing and replacement of the required penstock sections, all exposed metal surfaces should be cleaned, primed with a rust inhibitor, and painted with an appropriate coating.

f. The bent flashboard bars and the broken flashboard at the northern end of the spillway should be repaired.

Other measures which are recommended are as follow:

a. Prepare an Operation and Maintenance Manual.

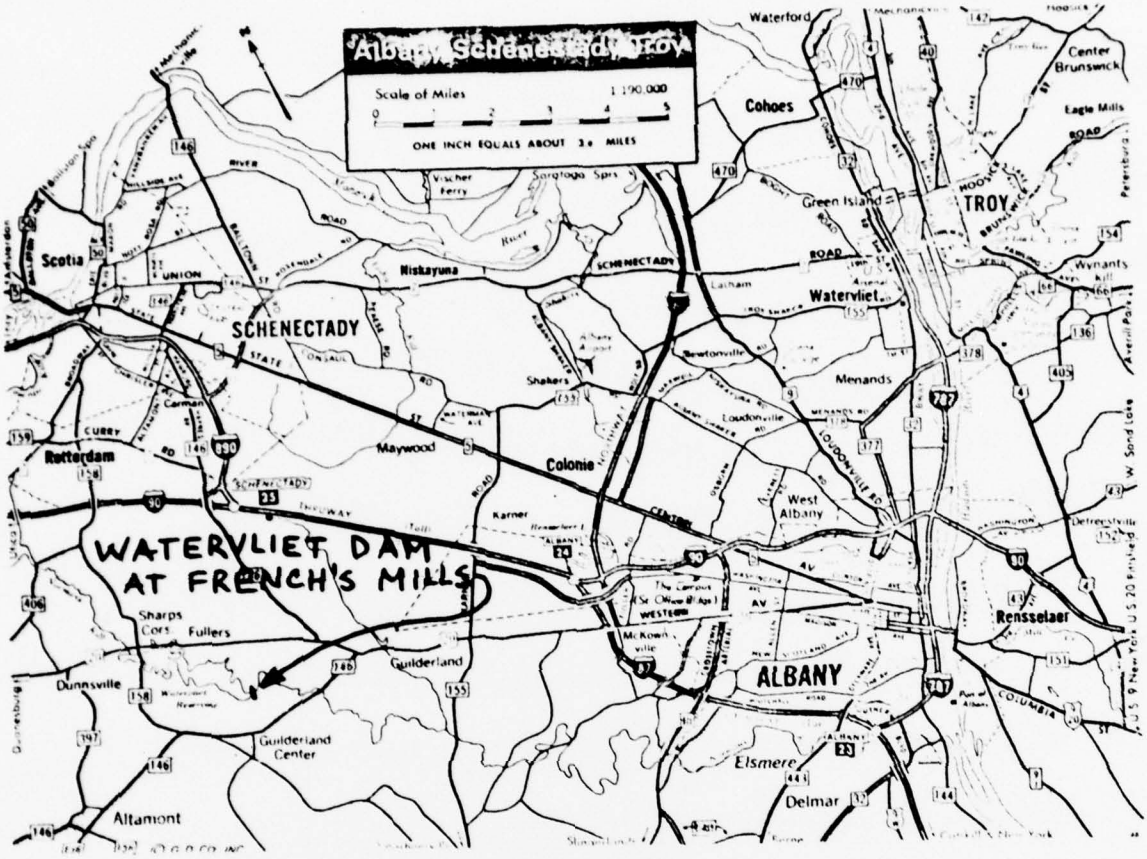
b. Establish a program of periodic inspections and maintenance, including "exercising" of the sluice gate and gate valve.

c. A system should be instituted to monitor the seepage through the south abutment within the dam.

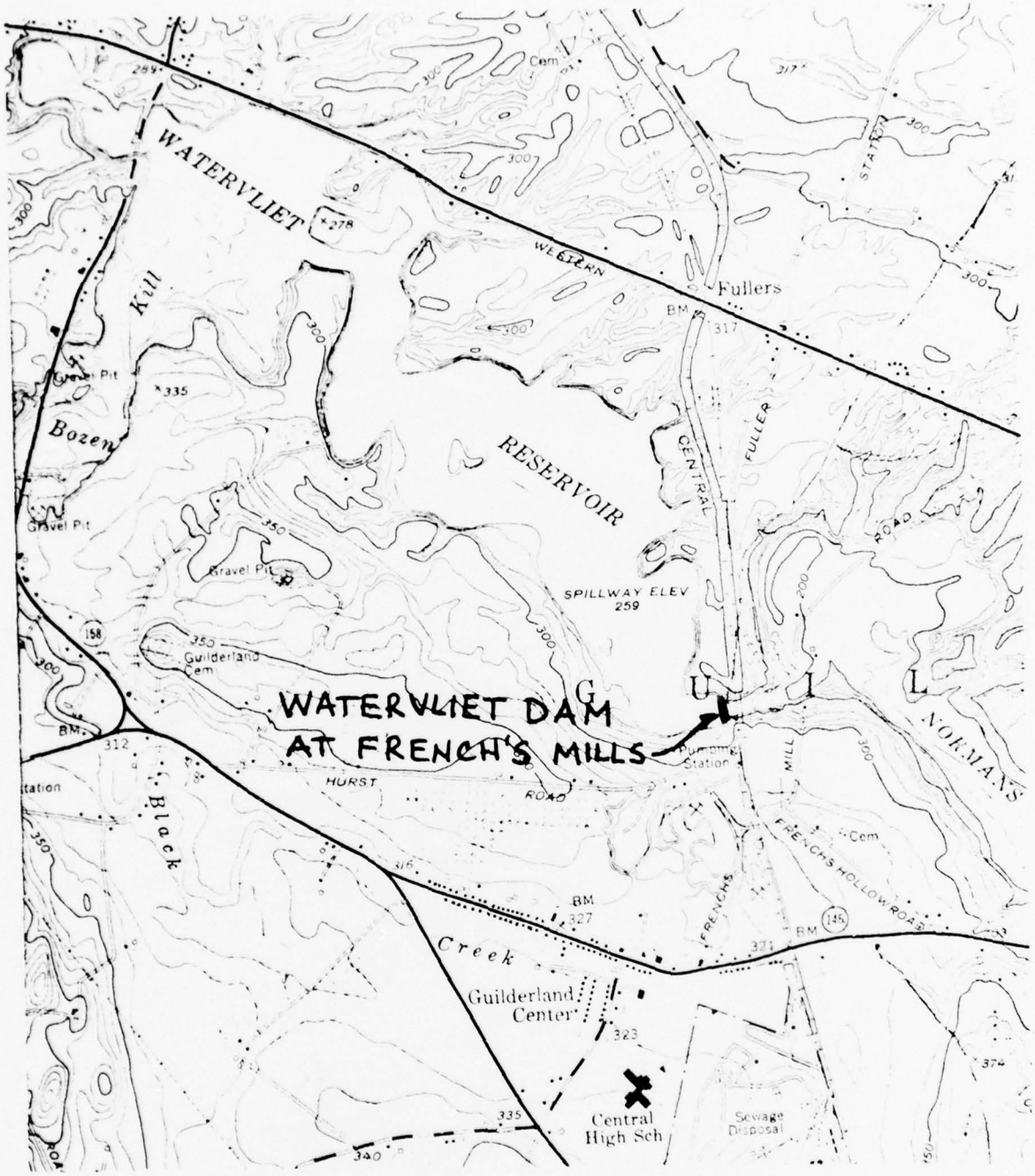
d. Daily observations of the reservoir level should be made.

DRAWINGS

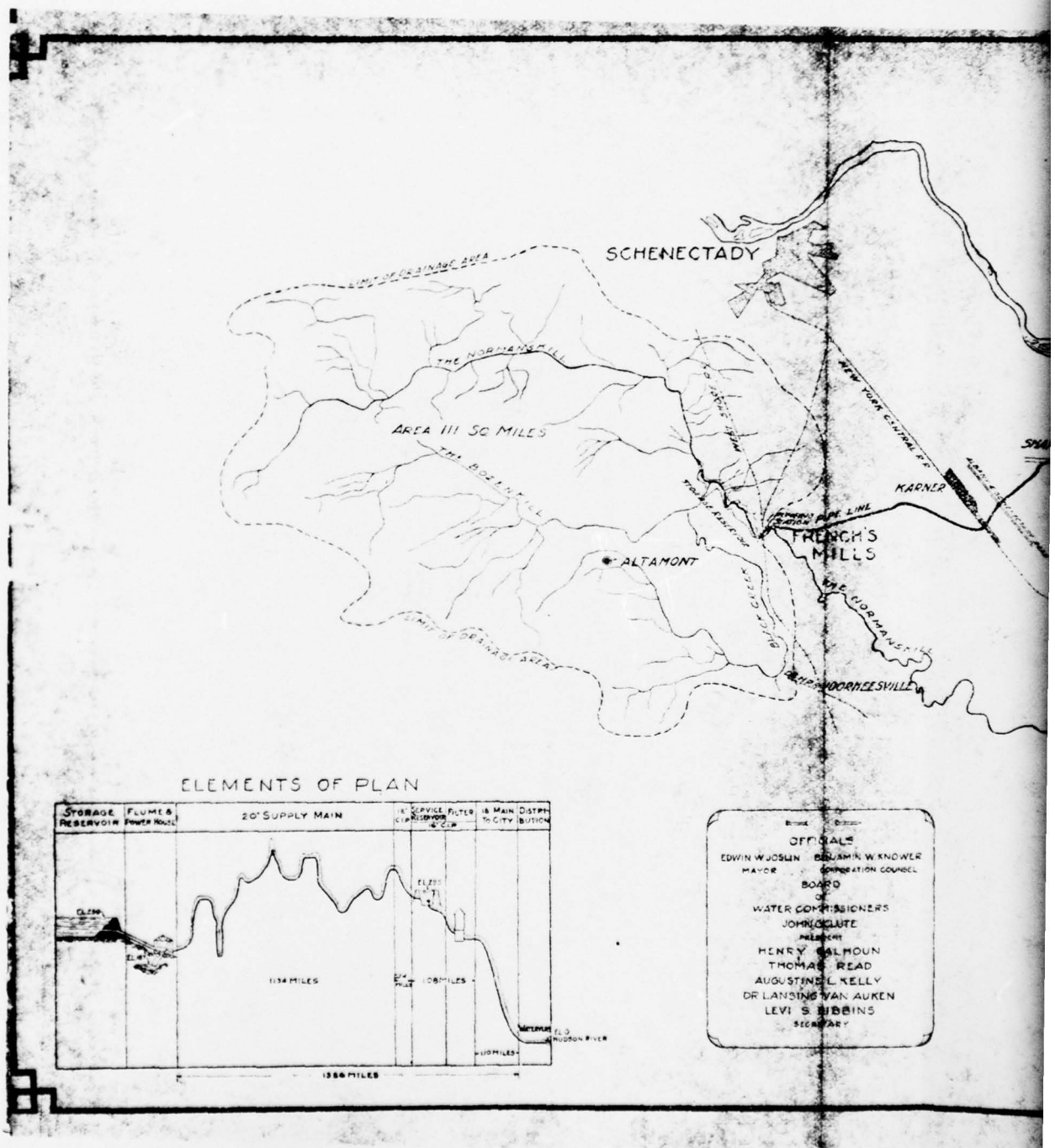
APPENDIX A

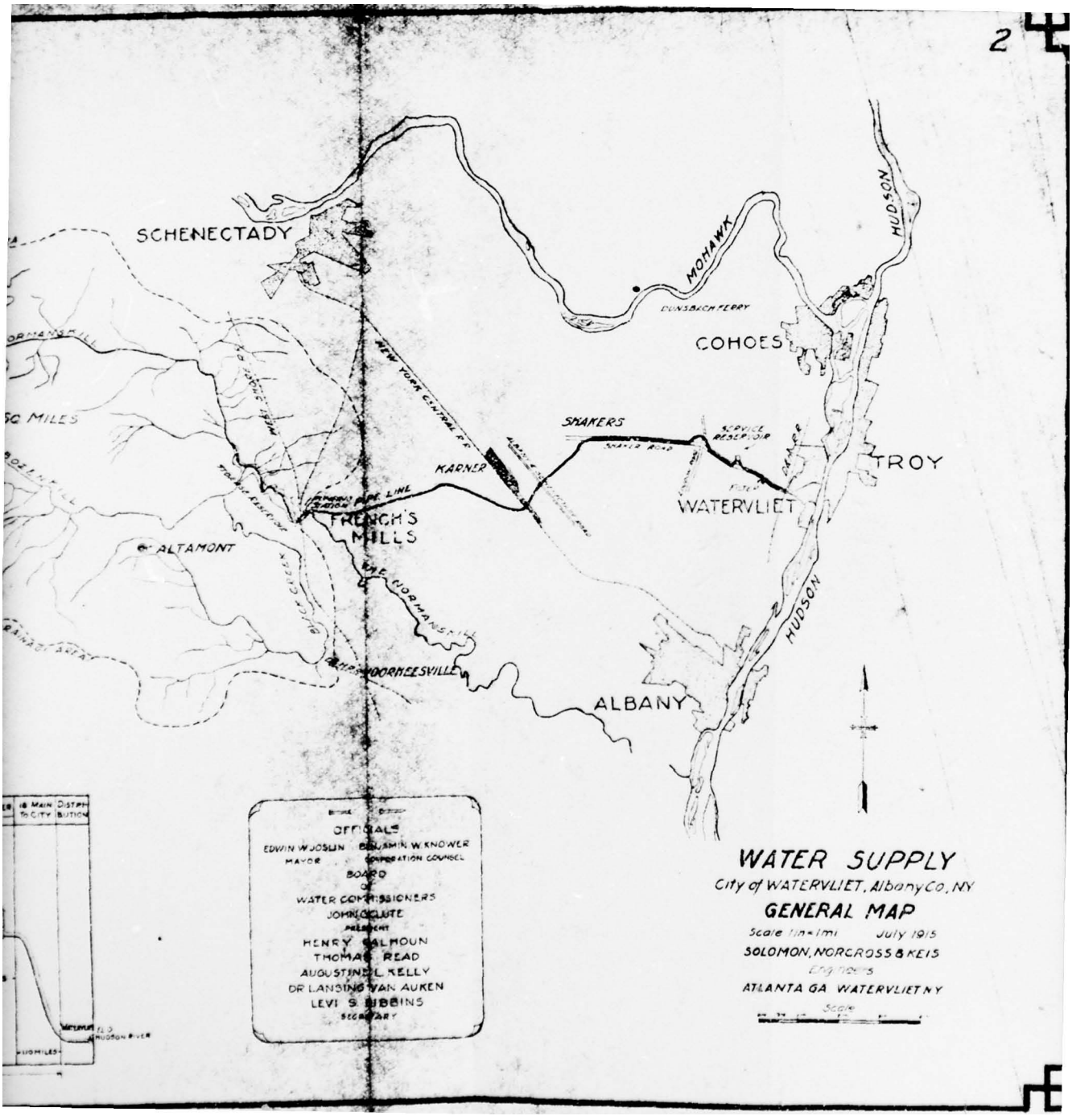


VICINITY MAP
WATERVLIET DAM



TOPOGRAPHIC MAP & RESERVOIR
WATERVLIET DAM

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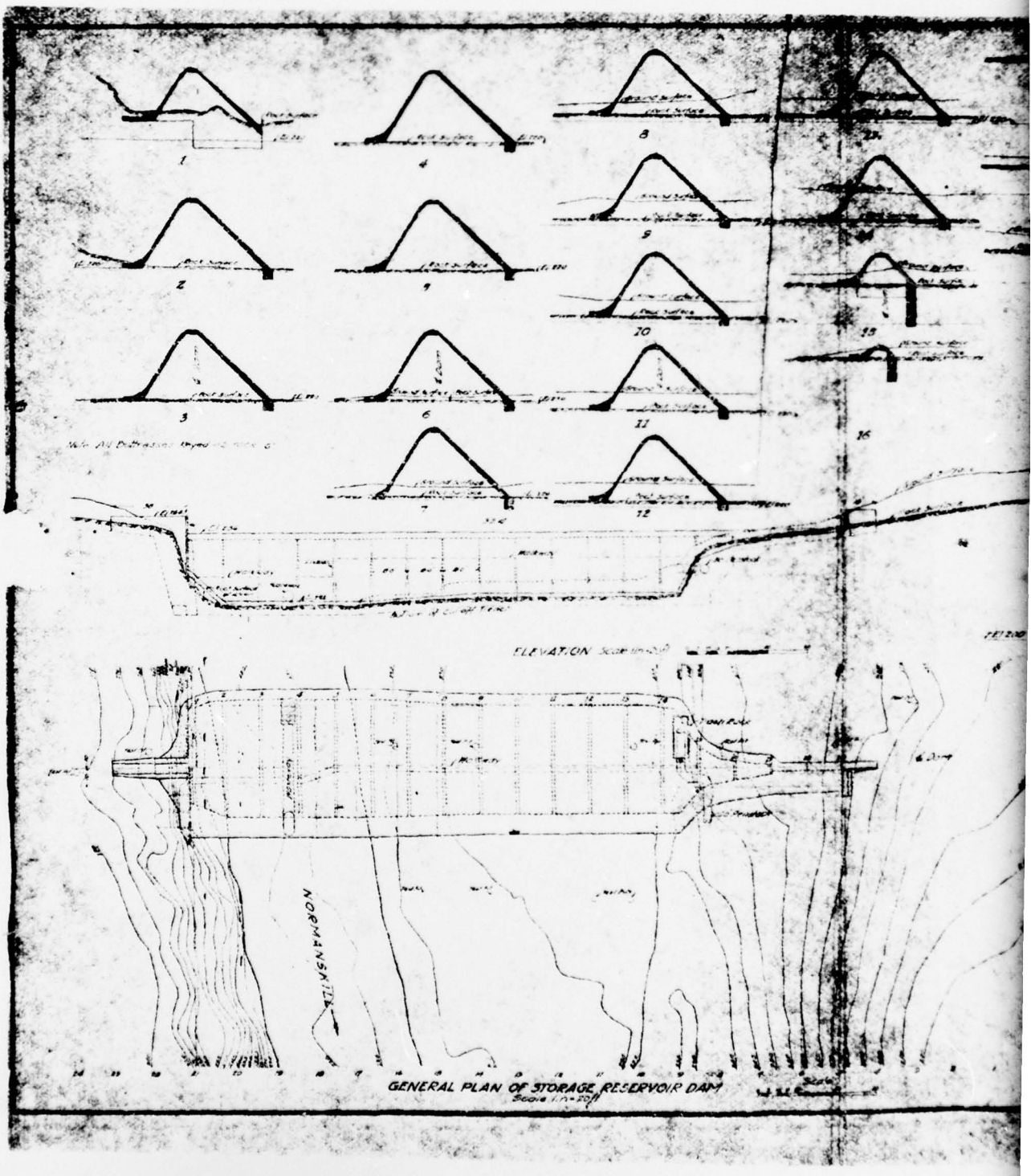
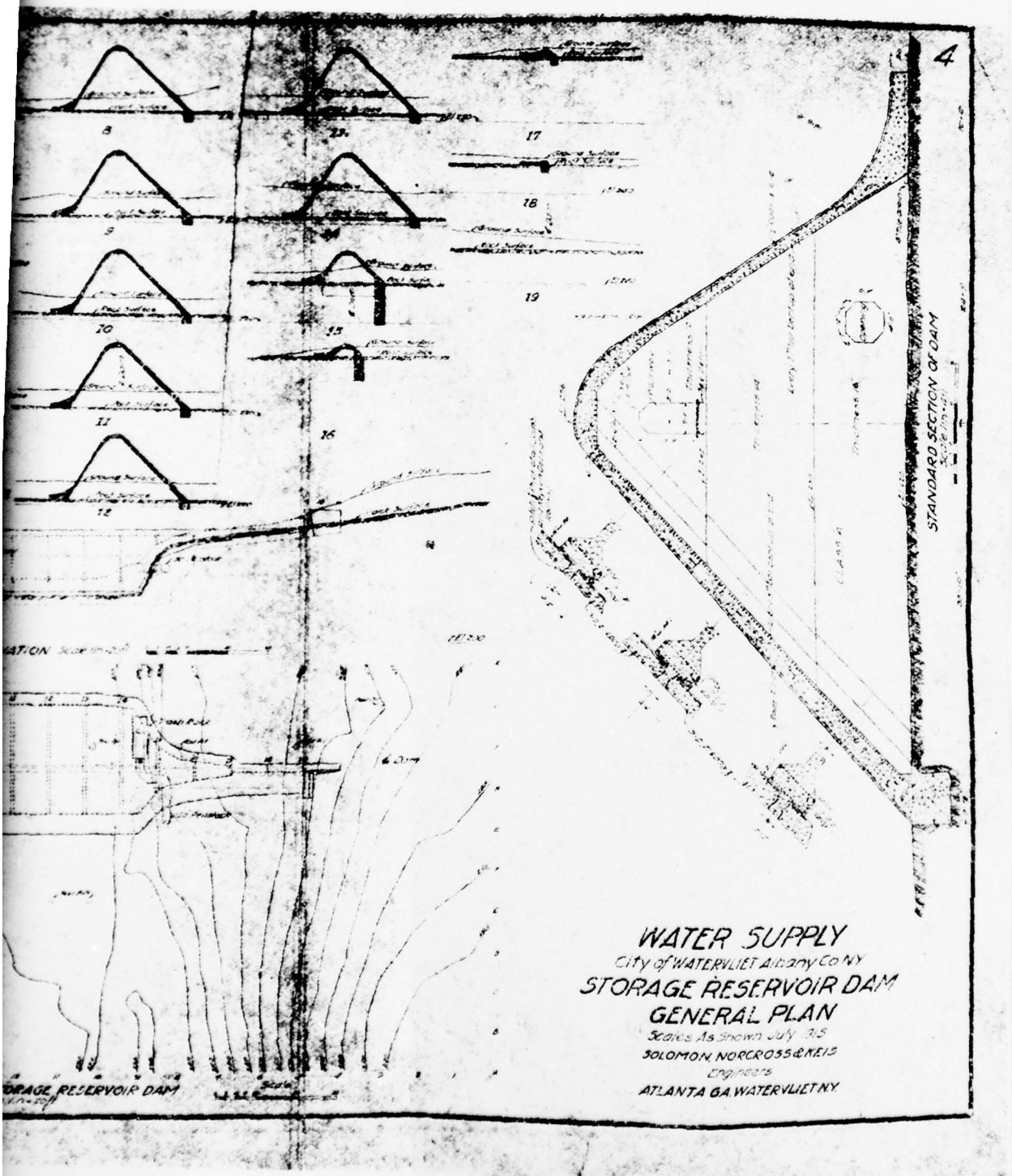
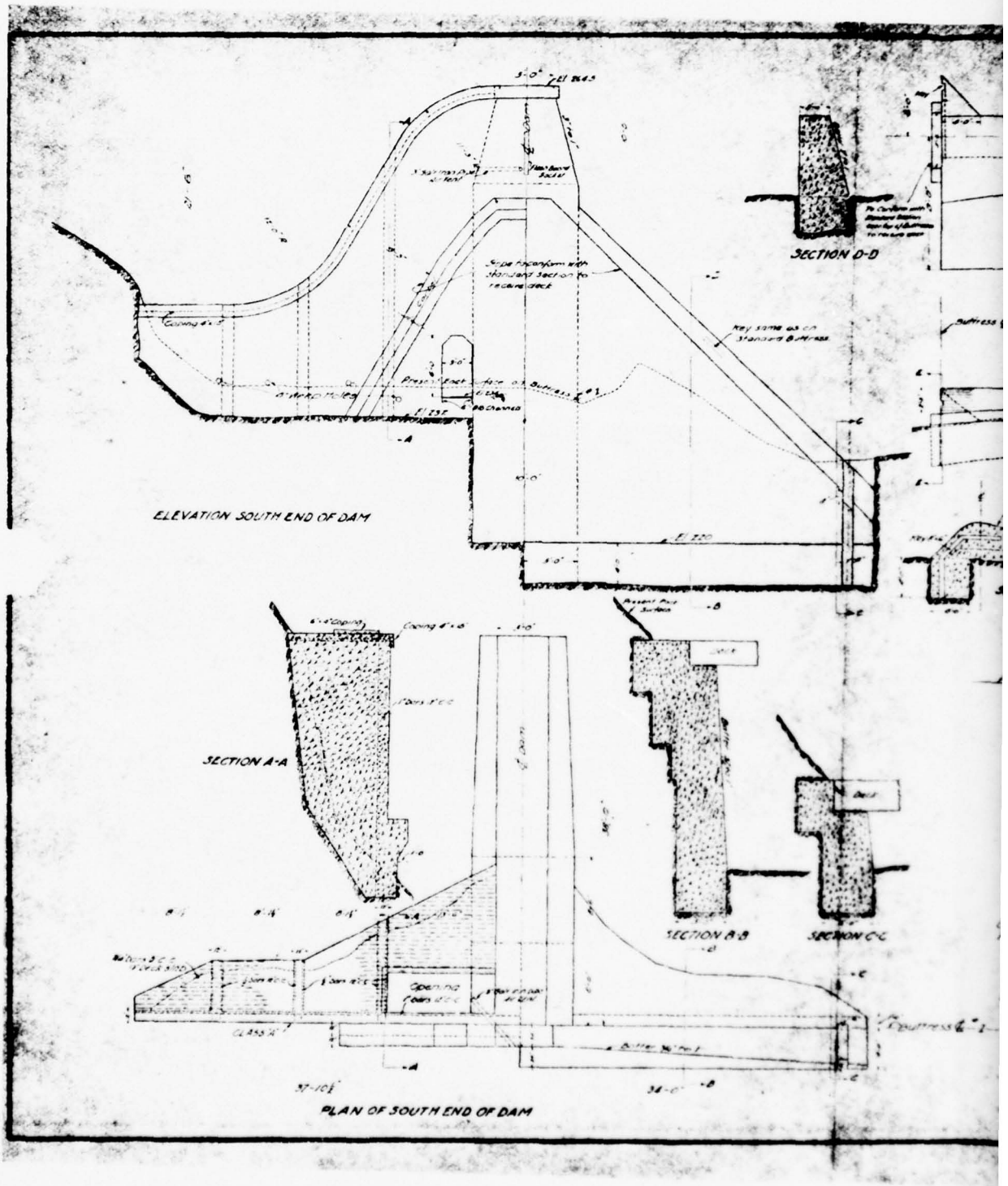
SECRETARY
WATER SUPPLY
City of WATERVLIET, Albany Co., NY
GENERAL MAP
Scale 1 in = 1 mi
July 1915
SOLOMON, NORCROSS & KEIS
Engineers
ATLANTA GA WATERVLIET NY
Scale







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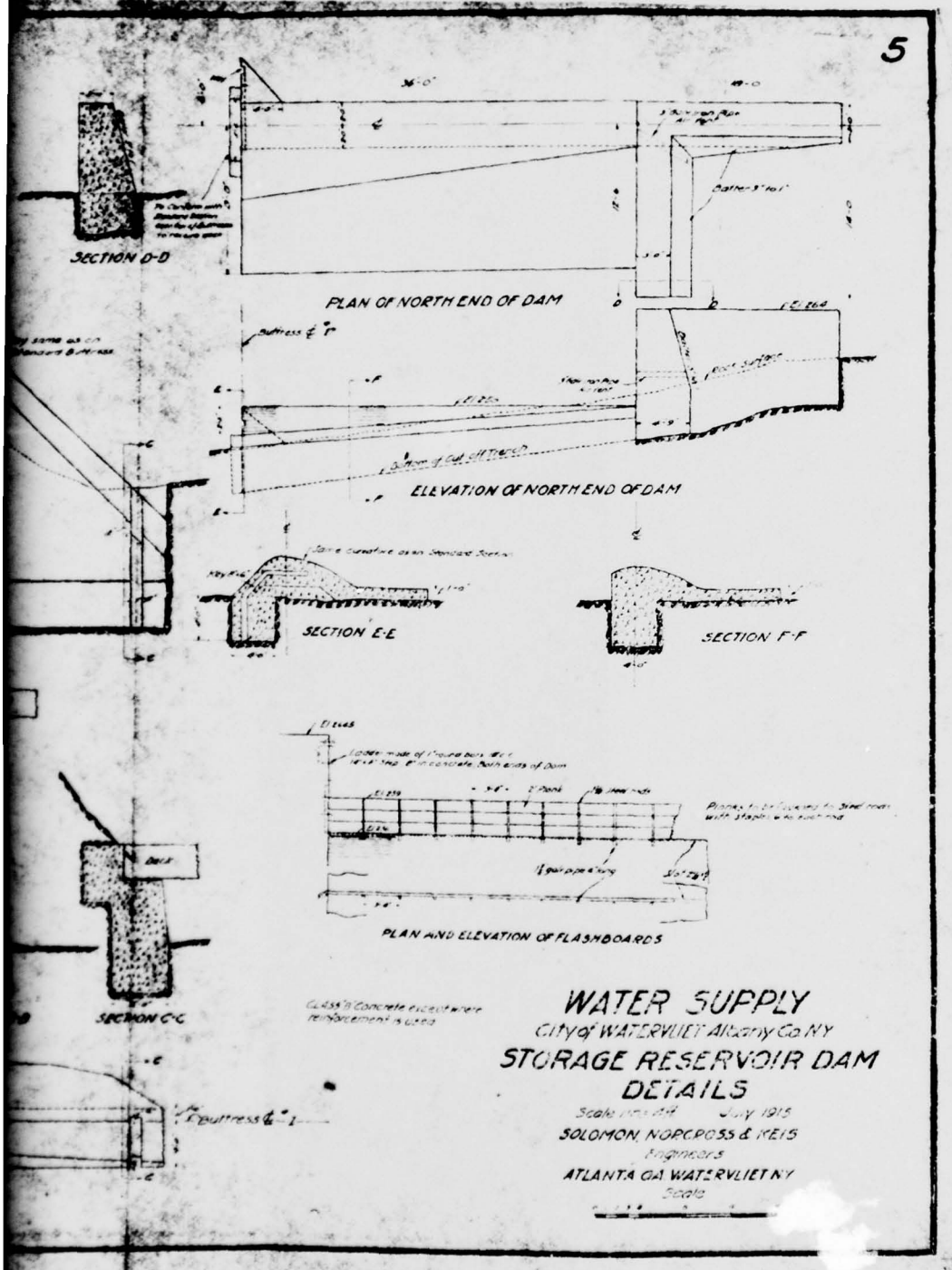


WATER SUPPLY

City of WATERVLIET Albany Co. N.Y.

STORAGE RESERVOIR DAM

DETAILS

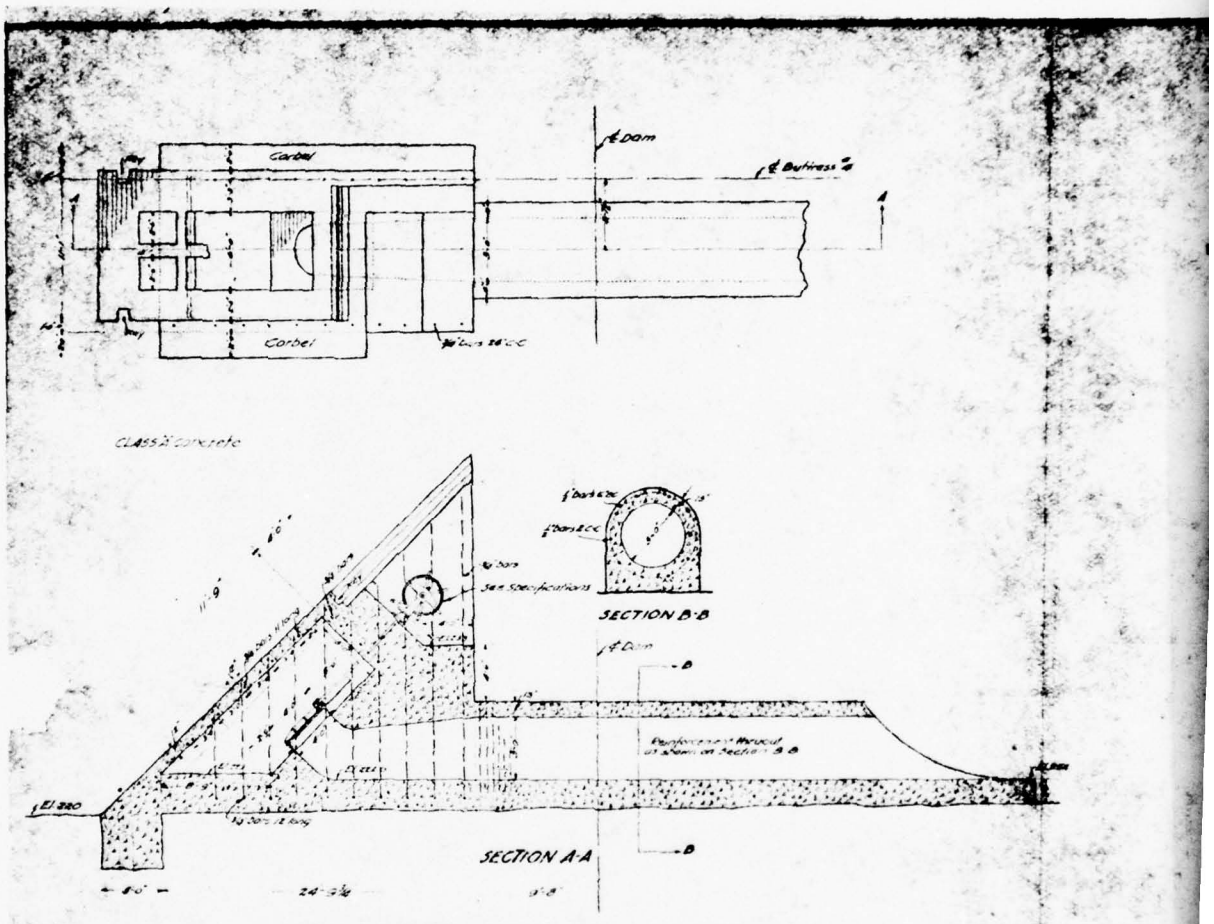
Scale 1/4"=1'-0" July 1915

SOLOMON NORCROSS & REIS

Engineers

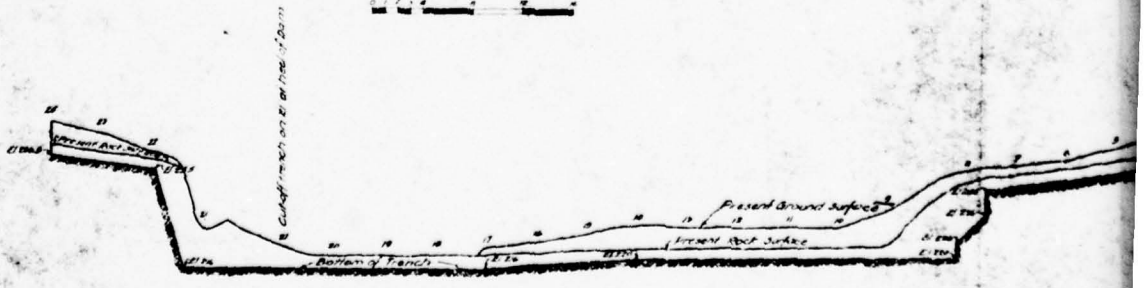
ATLANTA GA. WATERVLIET N.Y.

Scale



PLAN AND ELEVATION FOR SLUICE GATE AND CONDUIT

Scale 1 inch = 4 feet

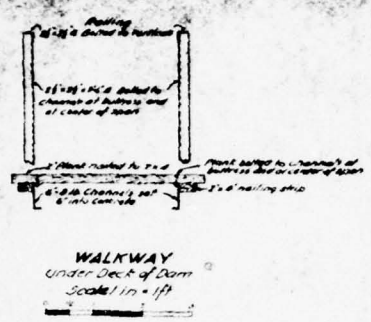


DEVELOPED PROFILE ALONG THE CUT-OFF TRENCH FOR STORAGE RESERVOIR DAM

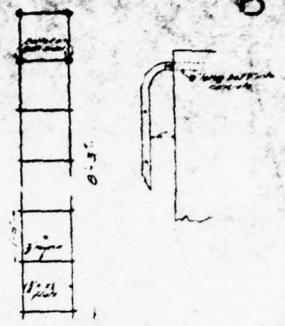
Scale Hor. 1 inch = 20 feet

2

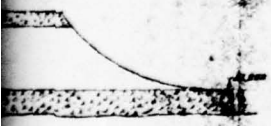
6

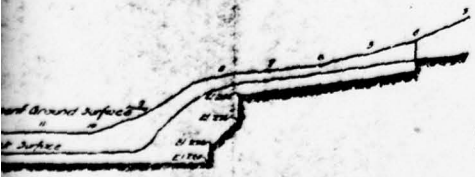


WALKWAY
Under Deck of Dam
Scale 1 in = 1ft



LADDER
To be attached to Buttress at Walkway
Scale 1in=1ft

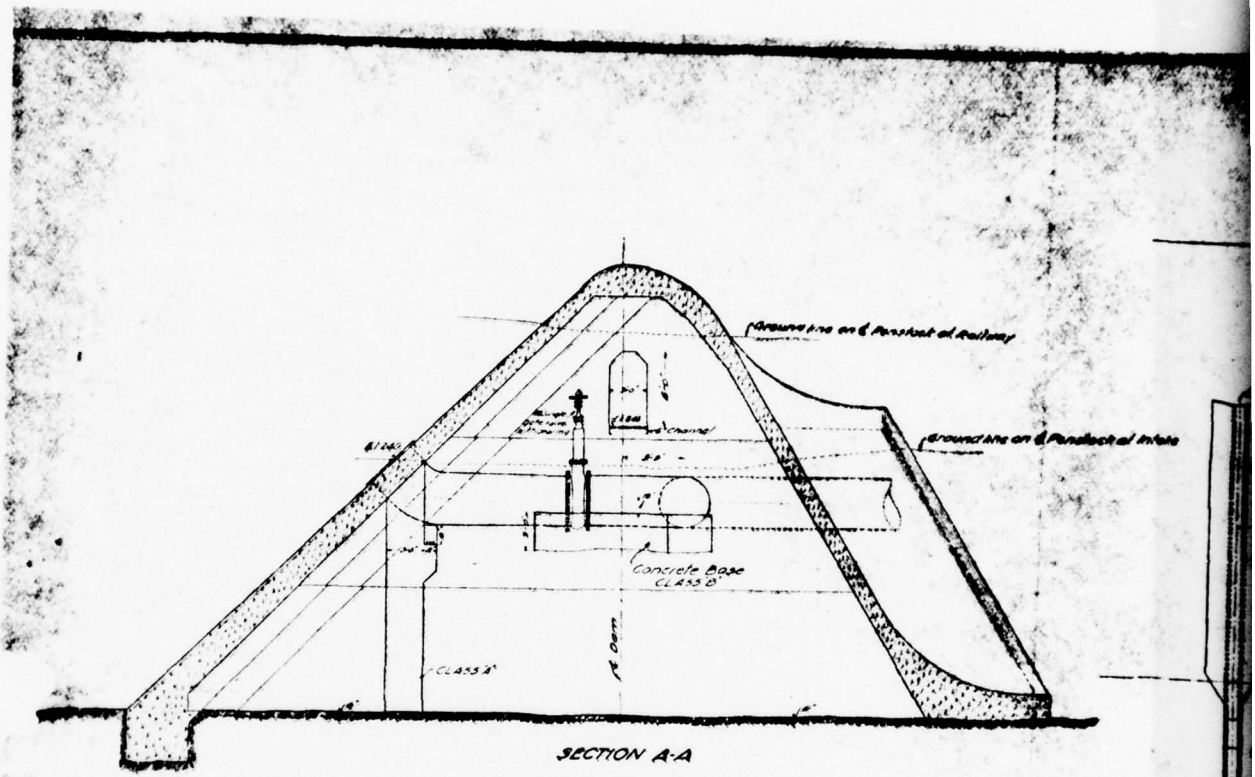




Cross Section Lines
See General Plan

STORAGE RESERVOIR DAM

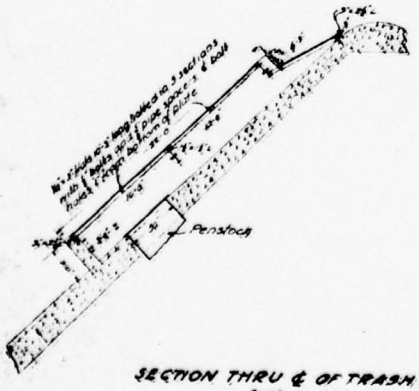
WATER SUPPLY
City of WATERVLIET Albany Co. NY
STORAGE RESERVOIR DAM
DETAILS
Scales As Shown July 1913
SOLOMON, NORCROSS & REIS
Engineers
ATLANTA GA. WATERVLIET NY



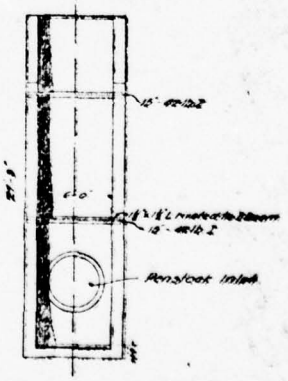
SECTION A-A

PENSTOCK THRU DAM
Trash rack removed
Scale 1in = 4ft

For reinforcement see drawing No.
Cut off wall, deck, railway, and buttresses CLASS 'A'



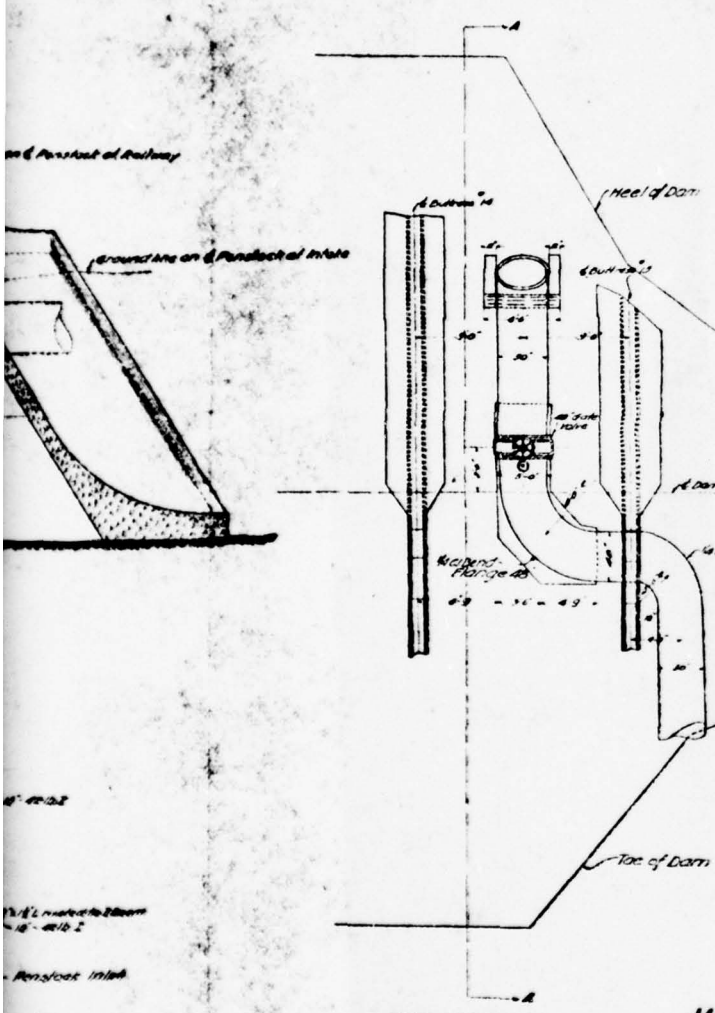
SECTION THRU ℄ OF TRASH RACK
Scale 1in = 4ft



PLAN OF TRASH RACK
Scale 1in = 4ft

2

7



PLAN OF PENSTOCK THRU DAM

WATER SUPPLY

City of WATERVLIET Albany Co NY

STORAGE RESERVOIR DAM DETAILS

Scales As Shown July 1913

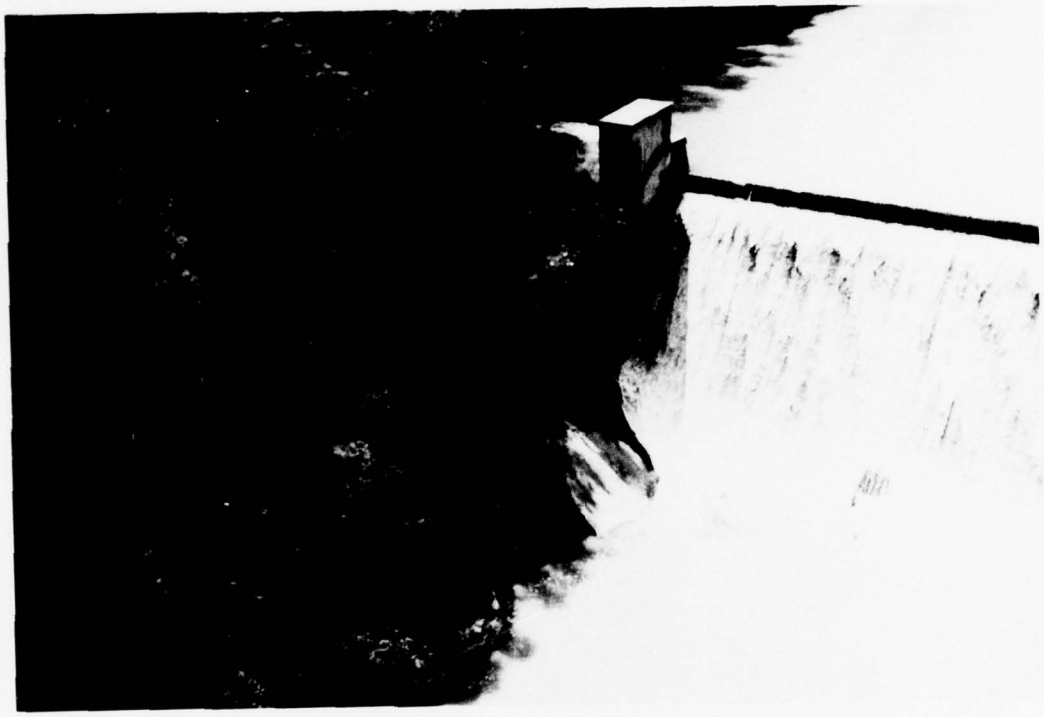
SOLOMON NORCROSS & REIS
Engineers
ATLANTA GA WATERVLIET NY

PHOTOGRAPHS

APPENDIX B

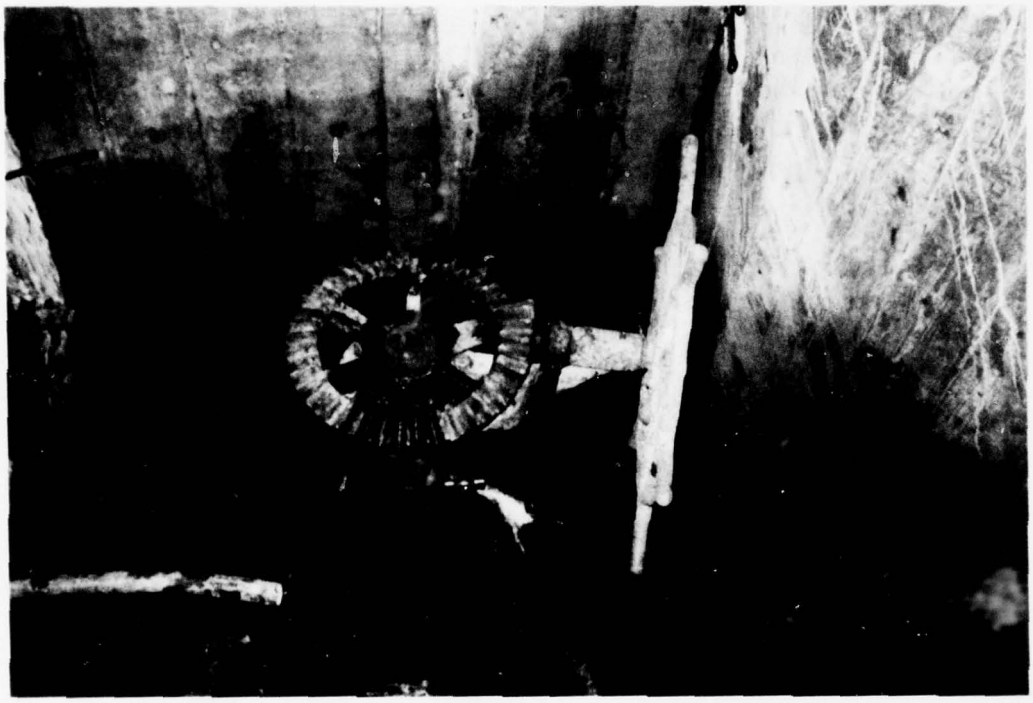
DOWNSTREAM TRAINING WALL AT NORTH ABUTMENT. NOTE EROSION OF CONCRETE AT BASE OF WALL (SEE NEXT PHOTO), BEDDING PLANES OF SHALE, AND RAILROAD BRIDGE DOWNSTREAM.

ERODED CONCRETE AT DOWNSTREAM EDGE OF NORTH ABUTMENT TRAINING WALL.

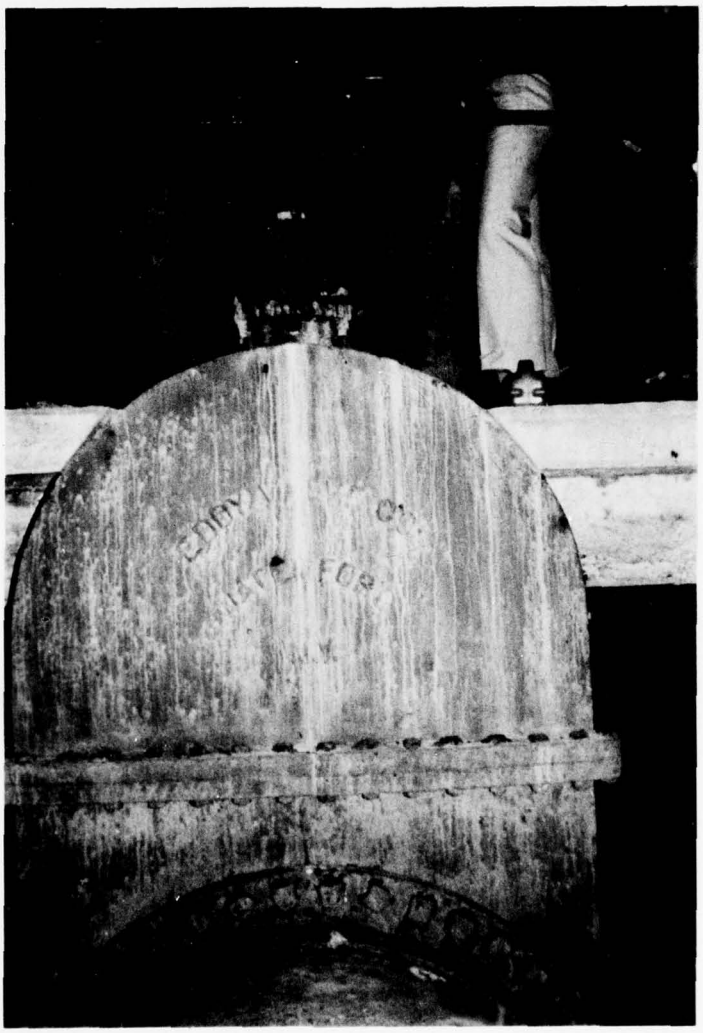


DOWNSTREAM TRAINING WALL AT SOUTH ABUTMENT SHOWING ENTRANCE TO DAM. NOTE EROSION OF CONCRETE AT BASE OF WALL (SEE NEXT PHOTO).

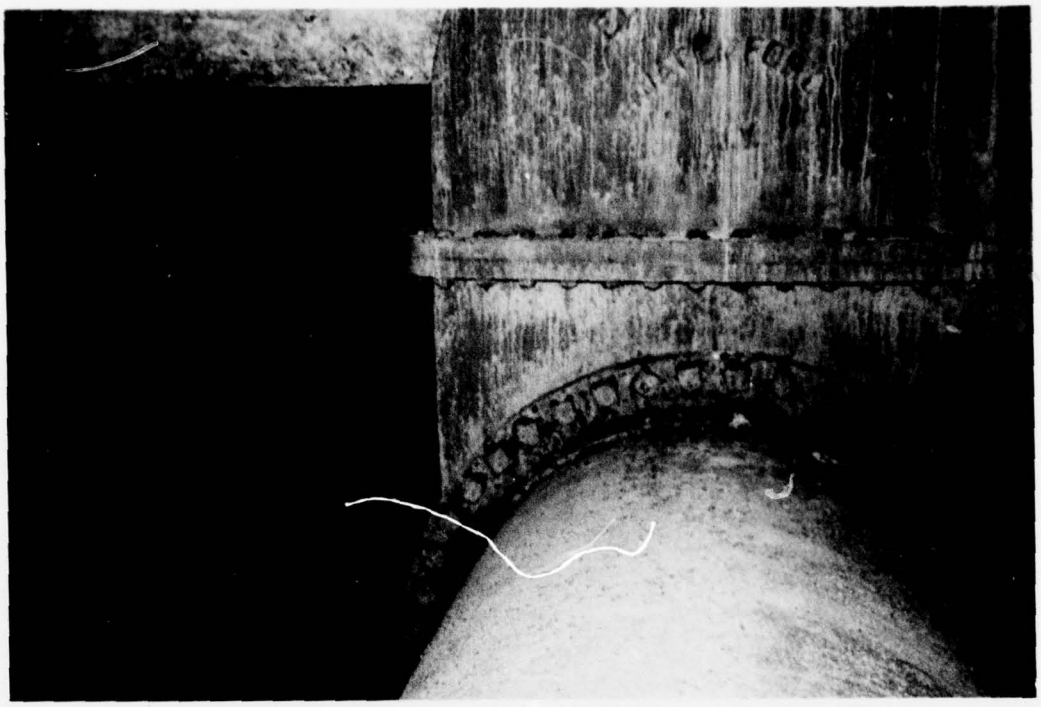
ERODED CONCRETE AT DOWNSTREAM EDGE OF
SOUTH ABUTMENT TRAINING WALL



VALVE STEM OPERATOR FOR SLUICE GATE ON LOW LEVEL OUTLET.



48" GATE VALVE ON WATER SUPPLY PENSTOCK FACING DOWNSTREAM



OVERVIEW OF PENSTOCK DOWNSTREAM OF GATE VALVE PASSING THROUGH BUTTRESS. NOTE CORROSION ON PENSTOCK.

CLOSE-UP OF CORROSION ON PENSTOCK SECTION PASSING THROUGH BUTTRESS.

PENSTOCK SECTION THROUGH DOWNSTREAM FACE OF DAM. ROUGH EDGE ALONG RIGHT SIDE OF PENSTOCK INDICATES EXTENT OF CORROSION.

ENGINEERING DATA CHECKLIST

APPENDIX C

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM WATERVLIET DAM AT FRENCH'S MILLS
ID # 88

ITEM	REMARKS
AS-BUILT DRAWINGS	None available. Contract dwgs included in "Proposal, Contract and Specifications for a Municipal Water Supply from the Normanskill at French's Mills for the City of Watervliet, N.Y."
REGIONAL VICINITY MAP	USGS
CONSTRUCTION HISTORY	Not available.
TYPICAL SECTIONS OF DAM	Shown on contract dwgs.
OUTLETS-PLAN	shown on contract dwgs.
-DETAILS	as above.
-CONSTRAINTS	None cited.
-DISCHARGE RATINGS	None available.
RAINFALL/RESERVOIR RECORDS	Rainfall - Albany County Airport Reservoir - None

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS	None available.
HYDROLOGY & HYDRAULICS	None available.
DAM STABILITY	None available.
SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS	None
BORING RECORDS	None
LABORATORY	None
FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Not applicable.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	North abutment training wall, about 1916-1925. Raised 1955. New concrete apron built 1936.
HIGH POOL RECORDS	None made. Recollection of 3 ft ± of water passing over spillway.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Guniting of spillway and apron 1965. Watervliet Water Supply System Engrg Study Parsons, Brinckerhoff, Quade & Douglas 1964. N.Y.S. Dept. of Health, Joint Municipal Water Survey Committee, Albany County, N.Y. Malcolm Pirnie Engineers 1968
PRIOR ACCIDENTS OR FAILURE OF DAM	
DESCRIPTION	Hurricane 1960 - Flashboard bars bent.
REPORTS	
MAINTENANCE OPERATION	No O & M Manual. Maintenance as deemed required.
RECORDS	No records.

ITEM	REMARKS
SPILLWAY PLAN	On contract dwgs.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT	On contract dwgs.
PLANS & DETAILS	

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. Basic Data

a. General

Name of Dam WATERVLIET DAM AT FRENCH'S MILLS Hazard Category High

County Albany ID# 88

Stream Name Normans Kill Tributary of —

Location Albany County Nearest Town (P.O.) Guilderland Center

Longitude 73° 57' 30" E Latitude 42° 42' 30" N Other Directions 3.5 miles south of Schenectady

Date of Insp June 5-6, 1978 Weather Sunny Temperature 70 +

b. Inspection Personnel K. Standig, Structural Engr.; G. Gaydar, Mechanical Engr.; A. Dolcimascolo, Geotechnical Engr.; V. Khlopotenkova, Observer.

c. Persons Contacted N. Ostrapkovich, City Hall Clerk, Watervliet.

d. History: Date Constructed Approx. 1916

Present Owner City of Watervliet

Designed by Solomon, Norcross & Lee

Constructed by —

Recent History —

2. Technical Data

Type of Dam Ambursen Drainage Area _____ Acres

Height 36 ft Length 380 ft

Upstream Slope 1(V) : 1 (H) Downstream Slope 1.7(V) : 1 (H)

Crest Width — Freeboard at Spillway Crest —

Low Level Control: (Type and Size) 5' diameter conduit with 4' sluice gate

Valve Condition _____

Spillway Type (Material) Concrete Width 324 ft

Side Slopes _____

Height (Crest to Top) _____

Exit Slope _____

Exit Length _____

Ponded Surface Area _____ Acres

Capacity (Normal Level) _____ Acre Feet

Capacity Emergency Spillway Level ____ Acre Feet

3. Embankment

Not Applicable

a. Crest _____

(1) Vertical Alignment _____

(2) Horizontal Alignment _____

(3) Longitudinal Surface Cracks _____

(4) Transverse Surface Cracks _____

(5) General Condition of Surface _____

(6) Miscellaneous _____

b. Upstream Slope_____

_____

(1) Undesirable Growth or Debris_____

_____

_____

(2) Sloughing, Subsidence, or Depressions_____

_____

_____

(3) Slope Protection_____

_____

_____

(a) Condition of Riprap_____

_____

_____

(b) Durability of Individual Stones_____

_____

_____

(c) Adequacy of Slope Protection Against Waves and Runoff_____

_____

_____

(d) Gradation of Slope Protection - Localized Areas of Fine Material

_____

_____

_____

(4) Surface Cracks_____

_____

_____

c. Downstream Slope_____

(1) Undesirable Growth or Debris_____

_____

_____

(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

(3) Surface Cracks on Face of Slope

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

(6) Fill Contact with Outlet Structure

(7) Condition of Grass Slope Protection

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

e. Area Downstream of Embankment, Including Tailrace Channel

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

(2) Evidence of "Piping" or "Boils"

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

(4) Unusual Muddy Water in Downstream Channel

(5) Sloughing or Erosion

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

(7) Stability of Tailrace Channel Sideslopes

(8) Condition of Tailrace Channel Riprap

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System

(1) Condition of Relief Wells, Drains and Appurtenances

(2) Unusual Increase or Decrease in Discharge from Relief Wells

4. Instrumentation

None

(1) Monumentation/Surveys —

(2) Observation Wells None

(3) Weirs None

(4) Piezometers None

(Other)

5. Reservoir

a. Slopes Portions of reservoir slopes visible from the dam show no signs of distress, instability or other adverse conditions.

b. Sedimentation Not visible.

6. Spillways

Spillway over almost entire length of dam.

a. ~~Principal Spillway: Inlet Condition~~ 324 ft long

~~Pipe Condition~~ D/s face of dam, concrete slab.

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

Recently (1965) applied gunite layer shows excessive spalling. At vertical joints, concrete is eroded several inches deep. Spillway apron cracked. Several bars supporting

~~b. Emergency Spillway: General Condition~~ flashboards are deflected. Top flashboard at North abutment broken for 5' length.

Tree Growth

Erosion

Other Observations

7. Structural (if required) See Attached Appendix

8. Downstream Channel

Normans Kill

a. Condition (obstructions, debris, etc.) Riprap, piers for two railroad bridges.

b. Slopes Steep slopes change to wider valley 1/2 mile D/s.

c. Approximate No. Homes and Population Pump station and several homes D/s would be affected by flood.

d. General

K. Standig for
A. Dolcimascolo
TEAM CAPTAIN

STRUCTURAL INSPECTION CHECKLIST

PHASE I DAM INSPECTION

1. Concrete Surfaces Good condition.

2. Structural Cracking None visible.

3. Movement - Horizontal and Vertical Alignment None noticeable.

4. Junctions with Abutments or Embankments Training walls at both abutments eroded.

5. Drains - Foundation, Joint, Face Not visible.

6. Water Passages, Conduits, Sluices Low level outlet appears in good condition. Excessive corrosion visible on water supply penstock. Sluice gate not visible.

7. Seepage or Leakage Seepage at south abutment is reportedly from a spring within the rock.

8. Monolith Joints - Construction Joints Good condition, no leakage.

9. Foundation thinly bedded, sound shale with foliation having strike oriented ~30° with respect to face of dam in NE direction & dipping ~ 5°-10° U/S.

10. Abutments Seepage at south abutment.

11. Control Gates Sluice gate not visible. Gate stand in good condition. Penstock gate valve in good condition.

12. Approach and Outlet Channels Riprap & bridge piers in D/s channel.

13. Stilling Basin Gunite layer reportedly eroded off concrete apron.

14. Intake Structure None

15. Settlement None

16. Stability

a. Overturning —

b. Sliding —

c. Seismic Not required - Seismic Zone No. 2

17. Instrumentation None

a. Alignment

b. Uplift

c. Seismic

18. Miscellaneous

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E

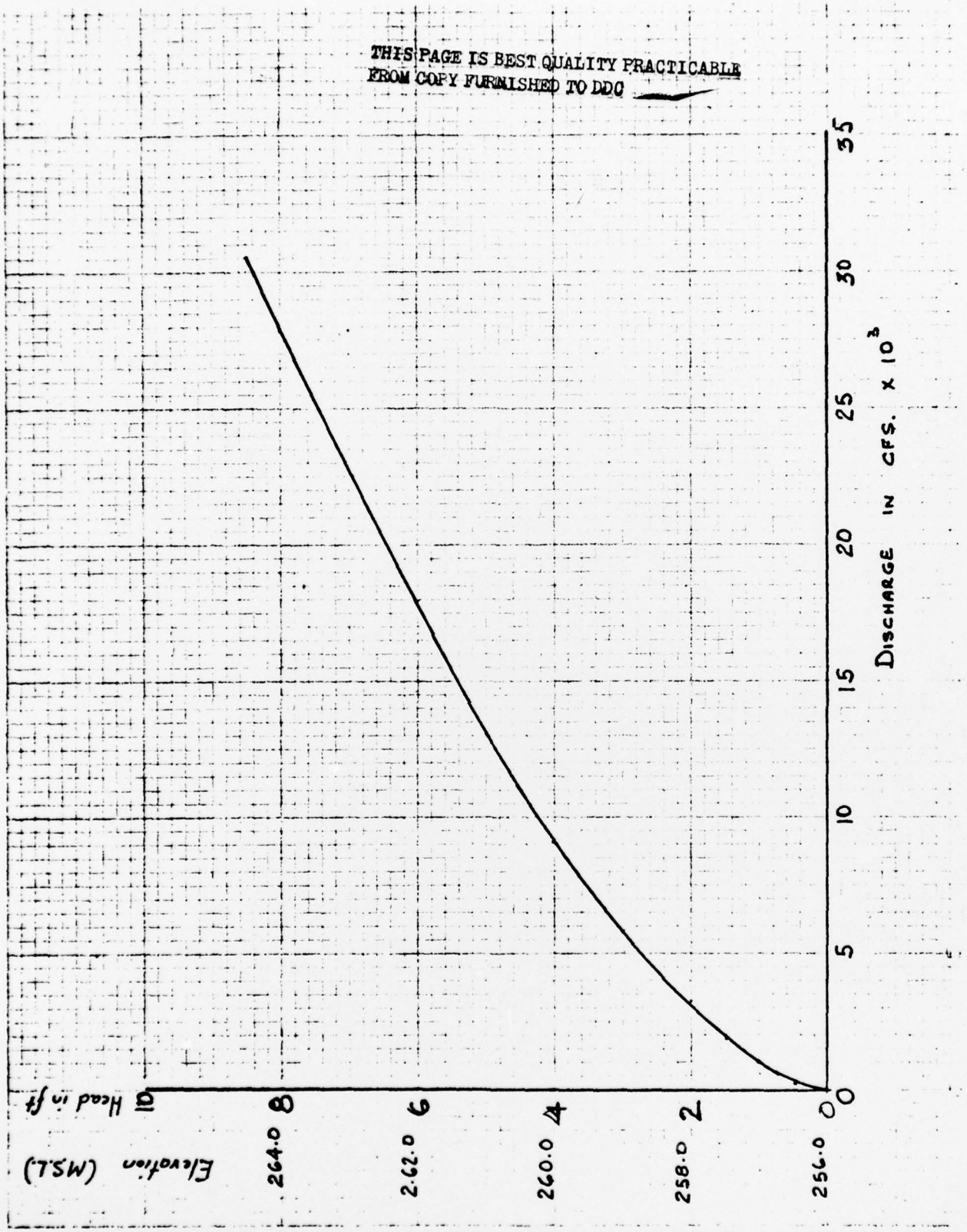
TAMS

Job No. 1487-09
Project NEW YORK DAM INSPECTION - PHASE I
Subject Watervliet Dam - Spillway Rating Curve.

Sheet ____ of ____
Date May 23, 78
By D.L.C.
Ch'k. by ____

Length 324.0'

Head feet	$H^{3/2}$	C	$Q = CLH^{3/2}$ cfs.
0.5		3.0	343.7
1.0	1.0	3.1	1004.4
1.5	1.84	3.2	1905.
2.0	2.83	3.3	3024
3.0	5.2	3.4	5724
4.0	8.0	3.5	9072
5.0	11.2	3.6	13,041
6.0	14.7	3.7	17,691
8.0	22.6	3.8	27,859
8.5	24.8	3.8	30,511



SPILLWAY RATING CURVE		PUTNAM ENGINEERING CORPORATION
1487-09	WATERVLIET DAM.	BY: D.L.C. DATE: JUNE. 78.